1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: CARBON DIOXIDE/ARGON/HELIUM GAS MIXTURE

TRADE NAMES: WELD MIX 21

CHEMICAL FAMILY: Inert Gas/Carbon Dioxide Mixture

PRODUCT USE: Welding Gas

MANUFACTURER

MATHESON TRI-GAS, INC.

959 ROUTE 46 EAST
PARSIPPANY, NJ  07054-0624
USA

Phone: 973/257-1100

EMERGENCY PHONE:

CHEMTREC (U.S. DOMESTIC):  1-800-424-9300
CHEMTREC INTERNATIONAL:  1-703-527-3887
CANUTEC (CANADA):     1-613-996-6666

2. COMPOSITION and INFORMATION ON INGREDIENTS

(10,000 ppm = 1%)

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>CAS #</th>
<th>mole %</th>
<th>EXPOSURE LIMITS IN AIR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ACGIH-TLV</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TWA ppm</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>124-38-9</td>
<td>1.0-75.0%</td>
<td>5000</td>
</tr>
<tr>
<td>Argon</td>
<td>7440-37-1</td>
<td>1.0-99.0%</td>
<td>There are no specific exposure limits for Argon. Argon is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.</td>
</tr>
<tr>
<td>Helium</td>
<td>7440-59-7</td>
<td>1.0-99.0%</td>
<td>There are no specific exposure limits for Helium. Helium is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.</td>
</tr>
</tbody>
</table>

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

See Section 16 for Definitions of Terms Used.
EMERGENCY OVERVIEW: This gas mixture is a colorless, non-flammable gas which is odorless or which has a sharp odor (due to the presence of Carbon Dioxide). A significant hazard associated with this gas mixture is the potential for Carbon Dioxide overexposures. Inhalation of this gas mixture can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. Severe inhalation exposures may be fatal, due to Carbon dioxide overexposure or asphyxiation. Moisture in the air could lead to the formation of carbonic acid which can be irritating to the eyes. A cylinder rupture hazard exists when this gas mixture, which is under pressure, is subject to heat or flames.

INHALATION: One of the most significant health hazards associated with this gas mixture is the potential for overexposure to Carbon Dioxide. Carbon Dioxide is an asphyxiant and a powerful cerebral vasodilator. If the concentration of Carbon Dioxide reaches 10% or more, suffocation can occur rapidly. Inhalation of concentrations between 2 and 10% can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. Carbon Dioxide initially stimulates respiration and then causes respiratory depression. Inhalation of low concentrations of Carbon Dioxide (3-5%) have no known permanent harmful effects. Symptoms in humans at various levels of concentration are as follows:

<table>
<thead>
<tr>
<th>CONCENTRATION</th>
<th>SYMPTOMS OF EXPOSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>Slight increase in breathing rate.</td>
</tr>
<tr>
<td>2%</td>
<td>Breathing rate increases to 50% above normal; headache; tiredness.</td>
</tr>
<tr>
<td>3%</td>
<td>Breathing increases to twice normal rate, becoming labored; weak narcotic effect; impaired hearing; headache; increase in blood pressure and pulse rate.</td>
</tr>
<tr>
<td>4-5%</td>
<td>Breathing increases to four times normal rate; symptoms of intoxication become evident and slight choking may be felt.</td>
</tr>
<tr>
<td>5-10%</td>
<td>Characteristic sharp odor noticeable. Very labored breathing, headache, visual impairment and ringing in the ears. Judgment may be impaired, followed by loss of consciousness.</td>
</tr>
<tr>
<td>&gt;10%</td>
<td>Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation.</td>
</tr>
</tbody>
</table>

Releases of this gas mixture may also cause an oxygen-deficient environment. The effects associated with various levels of oxygen include disturbed muscular coordination, abnormal fatigue, disturbed respiration, nausea, vomiting, collapse, or loss of consciousness. Death may occur due to asphyxiation. It is important to note that the asphyxiating properties of Carbon Dioxide will be reached before oxygen-deficiency is a significant factor.

CONTACT WITH SKIN or EYES: Moisture in the air could lead to the formation of carbonic acid, which can be irritating to the eyes. Contact with the eyes can cause damage to the retinal ganglion cells.

SKIN ABSORPTION: No component of this gas mixture presents a hazard of skin absorption.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Depending on the concentration of Carbon Dioxide, inhalation of this gas mixture cause nausea, dizziness, visual disturbances, shaking, headache, mental confusion, sweating, increased heartbeat, and elevated blood pressure and respiratory rate. Severe inhalation overexposures may be fatal, due the effects of Carbon Dioxide or asphyxiation. High concentrations of the gas mixture may cause eye irritation.

CHRONIC: Reversible effects on the acid-base balance in the blood, blood pressure, and circulatory system may occur after prolonged exposure to elevated Carbon Dioxide levels. Refer to Section 11 (Toxicological Information) of this MSDS for further information.

TARGET ORGANS: ACUTE: Respiratory system, cardiovascular system, eyes. CHRONIC: Cardiovascular system.

HMIS RATING: HEALTH = 1    FLAMMABILITY = 0    REACTIVITY = 0
Hazard Scale: 0 = Minimal  1 = Slight 2 = Moderate 3 = Serious 4 = Severe
4. FIRST-AID MEASURES

GENERAL INFORMATION: Remove to fresh air, as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Seek medical attention immediately.

SKIN EXPOSURE: If release of this gas mixture has resulted in frostbite, warm affected area slowly. Seek immediate medical attention.

EYE EXPOSURE: If release of this gas mixture has affected the eyes, seek immediate medical attention.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions, cardiovascular conditions and disorders involving the “Target Organs” (see Section 3, Hazard Identification) may be aggravated by overexposure to this gas mixture.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable-non-flammable gas.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):
- Lower (LEL): Not applicable.
- Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Use extinguishing materials appropriate for surrounding materials involved in the fire. Water spray should be used to cool fire-exposed containers.

UNUSUAL FIRE AND EXPLOSION HAZARD: This gas mixture does not burn; however, cylinders, when involved in a fire, may rupture or burst in the heat of the fire.

EXPLOSION SENSITIVITY TO MECHANICAL IMPACT: Not sensitive.

EXPLOSION SENSITIVITY TO STATIC DISCHARGE: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Immediately cool the cylinders with water spray from a maximum distance. When cool, move cylinders from fire area if this can be done without risk to firefighters.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used in the event of a significant release from a single cylinder. Call CHEMTREC (1-800-424-9300) for emergency assistance. Or if in Canada, call CANUTEC (613-996-6666).

Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there. Monitor the surrounding area for the level of Oxygen. The atmosphere must have at least 19.5 percent Oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.
8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate, explosion-proof ventilation to ensure compliance with exposure limits described in Section 2 (Composition and Information on Ingredients). Local exhaust ventilation is preferred, because it prevents dispersion of this gas mixture into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of Oxygen and the presence of potentially explosive air-gas mixtures.

RESPIRATORY PROTECTION: Maintain the Oxygen level above 19.5% in the workplace. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent U.S. State standards and Canadian CSA Standard Z94.4-93. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA’s Respiratory Protection Standard (1910.134-1998).
8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

RESPIRATORY PROTECTION: The following NIOSH respiratory protection recommendations for Carbon Dioxide concentrations in air are provided for additional guidance in respirator selection:

<table>
<thead>
<tr>
<th>CARBON DIOXIDE CONCENTRATION</th>
<th>RESPIRATORY EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 40,000 ppm:</td>
<td>Supplied Air Respirator (SAR); or full-facepiece Self-Contained Breathing Apparatus (SCBA).</td>
</tr>
<tr>
<td>Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions:</td>
<td>Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.</td>
</tr>
<tr>
<td>Escape:</td>
<td>Escape-type SCBA.</td>
</tr>
</tbody>
</table>

EYE PROTECTION: Splash goggles or safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133, or appropriate Canadian Standards.


BODY PROTECTION: Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to the task. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee’s feet may be exposed to electrical hazards, foot protection should be used, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

The following table provides physical property information on the main components of this gas mixture:

<table>
<thead>
<tr>
<th></th>
<th>ARGON</th>
<th>HELIUM</th>
<th>CARBON DIOXIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Density</td>
<td>0.103 lb/cu ft (1.650 kg/m³)</td>
<td>0.103 lb/cu ft (1.165 kg/m³)</td>
<td>0.1144 lb/ft³ (1.833 kg/m³)</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.38</td>
<td>0.138</td>
<td>0.90</td>
</tr>
<tr>
<td>Solubility in Water</td>
<td>0.056</td>
<td>0.0094</td>
<td>0.0491</td>
</tr>
<tr>
<td>Expansion Ratio</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Freezing Point</td>
<td>-189.2°C (-308.9°F)</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>-185.9°C (-302.6°F)</td>
<td>-268.9°C (-452.1°F)</td>
<td>Sublimes.</td>
</tr>
<tr>
<td>Specific Volume</td>
<td>9.71 ft³/lb</td>
<td>97.09 ft³/lb</td>
<td>8.741</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>39.95</td>
<td>4.00</td>
<td>44.01</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Coefficient Water/Oil Distribution</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
</tbody>
</table>
9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

The following information is pertinent to this gas mixture:

APPEARANCE, ODOR AND COLOR: This gas mixture is colorless and odorless, or may have a sharp odor (depending on the level of Carbon Dioxide).

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinct warning properties of this gas mixture, unless the Carbon Dioxide is at a high concentration, when the odor may be a warning property. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Stable at standard temperatures and pressures.

DECOMPOSITION PRODUCTS: The Carbon Dioxide component will produce Carbon Monoxide and Oxygen when heated to temperatures above 3000°F (1648°C). The Argon and Helium components of this product do not decompose, per se, but may react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Due to the presence of Carbon Dioxide, this gas mixture may be incompatible with a variety of metals, alloys, and metal acetylides (e.g., aluminum, chromium, and zirconium). Carbon Dioxide will react with alkaline materials to form carbonates and bicarbonates. The Argon and Helium components of this gas mixture are relatively inert gases.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Argon and Helium are simple asphyxiants (SA), which act to displace oxygen in the environment. The following data are available for the Carbon Dioxide component of this gas mixture.

CARBON DIOXIDE:

LCLo (inhalation, human) = 9 pph/5 minutes.
LCLo (inhalation, mammal) = 90000 ppm/5 minutes.
TCLo (inhalation, rat) = 6 pph/24 hours; reproductive and teratogenic effects.

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, IARC, NTP, CAL/OSHA, and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Due to the formation of carbonic acid, this gas mixture can be slightly irritating to contaminated eyes.

SENSITIZATION TO THE PRODUCT: The components of this product not known to be skin or respiratory sensitizers.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of the components of this gas mixture on the human reproductive system.

Mutagenicity: The components of this gas mixture are not reported to cause mutagenic effects in humans.

Embryotoxicity: The components of this gas mixture are not reported to cause embryotoxic effects in humans.

Teratogenicity: The components of this gas mixture are not reported to cause teratogenic effects in humans. Clinical studies involving test animals exposed to high concentrations of Carbon Dioxide indicate teratogenic effects (e.g., cardiac and skeletal malformations, stillbirths).

Reproductive Toxicity: The components of this gas mixture are not reported to cause adverse reproductive effects in humans. Studies involving test animals exposed to high concentrations of Carbon Dioxide show effects (e.g. changes in testes).

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, there are no Biological Exposure Indices (BEIs) determined for the components of this gas mixture.
12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas mixture will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen deficient environments.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No an adverse effect from this gas mixture on aquatic life is expected.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to Matheson Tri-Gas. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Argon, Helium, Carbon Dioxide)

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not applicable.

D.O.T HAZARD LABEL: Class 2.2 (Non-Flammable Gas)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as a Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles present serious safety hazards and should be discouraged.

NOTE: Shipment of compressed gas cylinders which have not been filled with the owner’s consent is a violation of Federal law (49 CFR, Part 173.301 (b).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas mixture is considered as dangerous goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gas, n.o.s. (Argon, Helium, Carbon Dioxide)

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not Applicable

HAZARD LABEL: 2.2 (Non-Flammable Gas)

SPECIAL PROVISIONS: None

EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.125

ERAP INDEX: None

PASSENGER CARRYING SHIP INDEX: None

PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): 126

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: No component of this product is subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act.
15. REGULATORY INFORMATION (Continued)

ADDITIONAL U.S. REGULATIONS (continued):

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. SARA HAZARD CATEGORIES (SECTION 311/312, 40 CFR 370-21): ACUTE: No; CHRONIC: No; FIRE: No; REACTIVE: No; SUDDEN RELEASE: Yes

U.S. TSCA INVENTORY STATUS: Components of this product are listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

U.S. STATE REGULATORY INFORMATION: Components of this product are covered under some

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this product is on the California Proposition 65 lists.

LABELING: Cylinders of this gas mixture should be labeled for precautionary information per the guidelines of the CGA. Refer to the CGA for further information.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are listed on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this product are not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This gas mixture would be categorized as a Controlled Product, Hazard Classes: A (compressed gas). The following symbol is required for WHMIS compliance for this gas mixture.

16. OTHER INFORMATION

CREATION DATE: April 5, 2000  REVISION DATE: June 28, 2005

REVISION HISTORY: Review and up-date of entire MSDS, June 2005.

MIXTURES: When two or more gases or liquefied gases are mix ed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you use the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 421 Walney Road, 5th Floor, Chantilly, VA 20151. Telephone: (703) 788-2700, Fax: (703) 961-1831.

“Safe Handling of Compressed Gases in Containers” (P-1, 1999)
“Safe Handling and Storage of Compressed Gases” (AV-1, 1999)
“Handbook of Compressed Gases” (1992)

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 3519, La Mesa, CA 91944-3519
619/670-0609
DEFINITIONS OF TERMS
A large number of abbreviations and acronyms appear on a MSDS. CAS #: This is the Chemical Abstract Service Number that uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:
CEILING LEVEL: The concentration that shall not be exceeded during any part of the working exposure.

DFG MAK Pregnancy Risk Group Classification: Group A: A risk of damage to the developing embryo or fetus has been unequivocally demonstrated. Exposure of pregnant women cannot lead to damage of the developing organism, even when MAK and BAT (Biological Tolerance Value for Working Materials) values are observed.

DFG MAK Pregnancy Risk Group Classification (continued): Group B: Currently available information indicates a risk of damage to the developing embryo or fetus must be considered to be probable. Damage to the developing organism cannot be excluded when pregnant women are exposed, even when MAK and BAT values are observed. Group C: There is no reason to fear a risk of damage to the developing embryo or fetus when MAK and BAT values are observed. Group D: Classification in one of the groups A-C is not yet possible because, although the data available may indicate a trend, they are not sufficient for final evaluation.

LOQ: Limit of Quantitation.

MAK: Federal Republic of Germany Maximum Concentration Values in the workplace.

NE: Not Established. When no exposure guidelines are established, an entry of NE is made for reference.

NIC: Notice of Intended Change.

NIOSH CEILING: The exposure that shall not be exceeded during any part of the workday. If instantaneous monitoring is not feasible, the ceiling shall be assumed as a 15-minute TWA exposure (unless otherwise specified) that shall not be exceeded at any time during a workday.

NIOSH RELs: NIOSH’s Recommended Exposure Limits.

PEL-Permissible Exposure Limit: OSHA’s Permissible Exposure Limits. This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA.

The OSHA Permissible Exposure Limits are based in the 1989 PEL's, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, “Vacated 1989 PEL,” is placed next to the PEL that was vacated by Court Order.

SKIN: Used when there is a danger of cutaneous absorption.

STEL-Short Term Exposure Limit: Short Term Exposure Limit, usually a 15-minute time-weighted average (TWA) exposure that should not be exceeded at any time during a workday, even if the 8-hr TWA is within the TLV-TWA, PEL-TWA or REL-TWA.

TLV-Threshold Limit Value: An airborne concentration of a substance that represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour workday.

TWA-Time Weighted Average: Time Weighted Average exposure concentration for a conventional 8-hr (TLV, PEL) or up to a 10-hr (REL) workday and a 40-hr workweek.

IDLH-Immediately Dangerous to Life and Health: This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM
HAZARD RATINGS: This rating system was developed by the National Paint and Coating Association and has been adopted by industry to identify the degree of chemical hazards.

HEALTH HAZARD:

0: (Minimal Hazard): No significant health risk, irritation of skin or eyes not anticipated. Skin Irritation: Essentially non-irritating. PI or Draize = “0.” Eye Irritation: Essentially non-irritating, or minimal effects which clear in < 24 hours [e.g. mechanical irritation]. Draize = “0.” Oral Toxicity LD50 Rat: ≤ 5000 mg/kg. Derma Toxicity LD50 Rat or Rabbit: < 2000 mg/kg. Inhalation Toxicity 4-hrs LC50 Rat: ≤ 20 mg/L.

1: (Slight Hazard): Minor reversible Injury may occur; slightly or mildly irritating. Skin Irritation: Slightly or mildly irritating. Eye Irritation: Slightly or mildly irritating. Oral Toxicity LD50 Rat: > 500-5000 mg/kg. Derma Toxicity LD50 Rat or Rabbit: > 1000-2000 mg/kg. Inhalation Toxicity 4-hrs LC50 Rat: 2-20 mg/L. 2: Moderate Hazard: Temporary or transitory injury may occur. Skin Irritation: Moderately irritating; primary irritant; sensitizer. PI or Draize > 0, ≤ 5. Eye Irritation: Moderately to severely irritating and/or corrosive; reversible corneal opacity; corneal involvement or irritation clearing in 8-21 days. Draize > 0, ≤ 25. Oral Toxicity LD50 Rat: > 50-500 mg/kg. Derma Toxicity LD50 Rat or Rabbit: > 200-1000 mg/kg. Inhaltion Toxicity 4-hrs Rat: > 0.5-2 ml/L. 3 (Serious Hazard): Major injury which, unless prompt action is taken and medical treatment is given; high level of toxicity; corrosive. Skin Irritation: Severely irritating and/or corrosive; may destroy dermal tissue, cause skin burns, dermal necrosis. PI or Draize > 5-8 with destruction of tissue. Eye Irritation: Corrosive; irreversible destruction of ocular tissue; corneal involvement or irritation persisting for more than 21 days. Draize > 80 with effects irreversible in 21 days. Oral Toxicity LD50 Rat: > 1-50 mg/kg. Derma Toxicity LD50 Rat or Rabbit: > 20-200 mg/kg. Inhalation Toxicity 4-hrs Rat: > 0.05-0.5 ml/L. 4 (Severe Hazard: Life-threatening; major or permanent damage may result from single or repeated exposure. Skin Irritation: Not appropriate. Do not rate as a “4,” based on skin irritation alone. Eye Irritation: Not appropriate. Do not rate as a “4,” based on eye irritation alone. Oral Toxicity LD50 Rat: ≤ 1 mg/kg. Derma Toxicity LD50 Rat or Rabbit: ≤ 20 mg/kg. Inhalation Toxicity 4-hrs Rat: ≤ 0.05 ml/L."

FLAMMABILITY HAZARD:

0: (Minimal Hazard): Materials that will not burn in air when exposed to a temperature of 815.5°C [1500°F] for a period of 5 minutes.; 1: (Slight Hazard: Materials that must be pre-heated before ignition can occur. Material require considerable pre-heating, under all ambient temperature conditions before ignition and combustion can occur., Materials that will burn in air at almost any temperature, or, unaffected by ambient temperature, are readily ignited under almost all conditions. Materials in this degree would not, under normal conditions, form hazardous atmospheres in air, but under high ambient temperatures or moderate heating may release vapor in sufficient quantities to produce hazardous atmospheres in air, Including: Liquids having a flash-point at or above 37.8°C [100°F]; Solid materials in the form of coarse dusts that may burn rapidly but that generally do not form explosive atmospheres; Solid materials in a fibrous or shredded form that may burn rapidly and create flash fire hazards (e.g. cotton, sisal, hemp; Solids and semisolids that readily give off flammable vapors.; 3 (Serious Hazard: Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient conditions; or, unaffected by ambient temperature, are readily ignited under almost all conditions, including: Liquids having a flash point below 22.8°C [73°F] and having a boiling point at or above 38°C [100°F] and below 37.8°C [100°F] [e.g. OSHA Class IIIB and IC]; Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air [e.g. dusts of combustible solids, mists or droplets of flammable liquids]; Materials that burn extremely rapidly, usually by reason of self-contained oxygen [e.g. dry nitrocellulose and many organic peroxides];
HAZARDOUS MATERIALS IDENTIFICATION SYSTEM
HAZARD RATINGS (continued):

4 (Severe Hazard—Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air, and which will burn readily, including: Flammable gases; Flammable cryogenic materials; Any liquid or gaseous material that is liquid while under pressure and has a flash point below 22.8°C [73°F] and a boiling point below 37.8°C [100°F] [e.g. OSHA Class IA; Material that ignite spontaneously when exposed to air at a temperature of 54.4°C [130°F] or below [e.g. pyrophoric]).

PHYSICAL HAZARD:

0 (Water Reactivity: Materials that do not react with water. Organic Peroxides: Materials that are normally stable, even under fire conditions and will not react with water. Explosives: Substances that are Non-Explosive. Unstable Reactives: Materials that are normally unstable and will readily react, but only under conditions of high temperature and/or pressure and have little or no potential to cause significant heat generation or explosive hazard. Substances that readily undergo hazardous polymerization in the absence of inhibitors.); 1 (Water Reactivity: Materials that may react violently with water. Organic Peroxides: Materials that, in themselves, are normally unstable and will readily react, but only under conditions of high temperatures and pressures. These materials may react with water, but will not release energy. Explosives: Division 1.5 & 1.6 substances that are very insensitive explosives or that do not have a mass explosion hazard. Compressed Gases: Pressure below 514.7 psi absolute at 21.1°C [70°F] [500 psig]. Pyrophorics: No Rating. Oxidizers: Packaging Group II: Solids: any material that in either concentration tested, exhibits a mean burning time less than or equal to the mean burning time of a 3:7 potassium bromate/cellulose mixture and the criteria for Packing Group I and II are not met. Liquids: any material that exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 nitric acid (65%)/cellulose mixture and the criteria for Packing Group I and II are not met. Unstable Reactives: Substances that may decompose, condense or self-react at ambient temperature and/or pressure and have a moderate potential to cause significant heat generation or explosion.); 2 (Water Reactivity: Materials that react explosively with water without requiring heat or confinement. Organic Peroxides: Materials that are readily capable of detonation or explosive decomposition at normal temperature and pressures. Explosives: Division 1.1 & 1.2-explosive substances that have a mass explosion hazard or have a projection hazard. A mass explosion is one that affects almost the entire load instantaneously. Compressed Gases: No Rating. Pyrophorics: Add to the definition of Flammability “4”. Oxidizers: No “0” rating. Unstable Reactives: Substances that may polymerize, decompose, condense or self-react at ambient temperature and/or pressure and have a high potential to cause significant heat generation or explosion.); 3 (continued): Explosives: Division 1.2 – Explosive substances that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but do not have a mass explosion hazard. Compressed Gases: Pressure > 514.7 psi absolute at 21.1°C (70°F) [500 psig]. Pyrophorics: No Rating. Oxidizers: Packing Group I: Solids: any material that, in either concentration tested, exhibits a mean burning time less than the mean burning time of a 3:2 potassium bromate/cellulose mixture. Liquids: Any material that spontaneously ignites when mixed with cellulose in a 1:1 ratio, or which exhibits a mean pressure rise time less than the pressure rise time of a 1:1 perchloric acid (50%)/cellulose mixture. Unstable Reactives: Substances that may polymerize, decompose, condense or self-react upon exposure to moisture. Organic Peroxides: Materials that may form explosive reactions with water. Organic Peroxides: Materials that are capable of detonation or explosive reaction, but require a strong initiating source, or must be heated under confinement before initiation; or materials that react explosively with water.

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

HEALTH HAZARD: 0 (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); 1 (materials that on exposure under fire conditions could cause minor skin or minor residual injury); 2 (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); 3 (materials that can on short exposure could cause serious temporary or residual injury); 4 (materials that under very short exposure could cause death or major residual injury).

FLAMMABILITY HAZARD: 0 Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand. 1 Materials that must be preheated before ignition can occur. Materials in this degree require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur. 2 Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air. 3 Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions. 4 Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and will burn readily.
DEFINITIONS OF TERMS (Continued)
HAZARDOUS MATERIALS IDENTIFICATION SYSTEM
HAZARD RATINGS (continued):

PHYSICAL HAZARD (continued):
INSTABILITY HAZARD: 0  Materials that in themselves are normally stable, even under fire conditions.  1 Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures.  2 Materials that readily undergo violent chemical change at elevated temperatures and pressures.  3 Materials that in themselves are capable of detonation or explosive decomposition or explosive reaction, but that require a strong initiating source or that must be heated under confinement before initiation.  4 Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures.

FLAMMABILITY LIMITS IN AIR: Much of the information related to fire and explosion is derived from the National Fire Protection Association (NFPA). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:
Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: LD₅₀ - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; LC₅₀ - Lethal Concentration (gases) which kills 50% of the exposed animals; ppm concentration expressed in parts per million of air or water; mg/m³ concentration expressed in weight of substance per volume of air; mg/kg quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include TDL₀, the lowest dose to cause a symptom and TCL₀ the lowest concentration to cause a symptom; TDo, LDo, and LCo, or TC, TC₀, LCo, and LCo, the lowest dose (or concentration) to cause lethal or toxic effects.

TOXICOLOGICAL INFORMATION (continued):
Cancer Information:  The sources are: IARC - the International Agency for Research on Cancer; NTP - the National Toxicology Program, RTECS - the Registry of Toxic Effects of Chemical Substances, OSHA and CAL/OSHA. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other Information: BEI - ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

ECOLOGICAL INFORMATION:
BCF = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter; EC is the Effect Concentration in water; EC₅₀ is the Effed Concentration for 50% of the organisms exposed; NOEC is the No Observed Effect Concentration; MATC is the Maximum Acceptable Toxicant Concentration; NOLC is the No Observed Lethal Concentration; TL₅₀ = median threshold limit; Coefficient of Oil/Water Distribution is represented by log Kₐw or log K₂ₐ and is used to assess a substance’s behavior in the environment.

REGULATORY INFORMATION:
U.S. and CANADA: This section explains the impact of various laws and regulations on the material. EPA is the U.S. Environmental Protection Agency. WHMIS is the Canadian Workplace Hazardous Materials Information System. DOT and TC are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (SARA); the Canadian Domestic/Non-Domestic Substances List (DSL/NDSL); the U.S. Toxic Substance Control Act (TSCA); Marine Pollutant status according to the DOT; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund); and various state regulations. This section also includes information on the precautionary warnings which appear on the material’s package label.